

Developing Green



The Costs and Benefits of Green Affordable Housing



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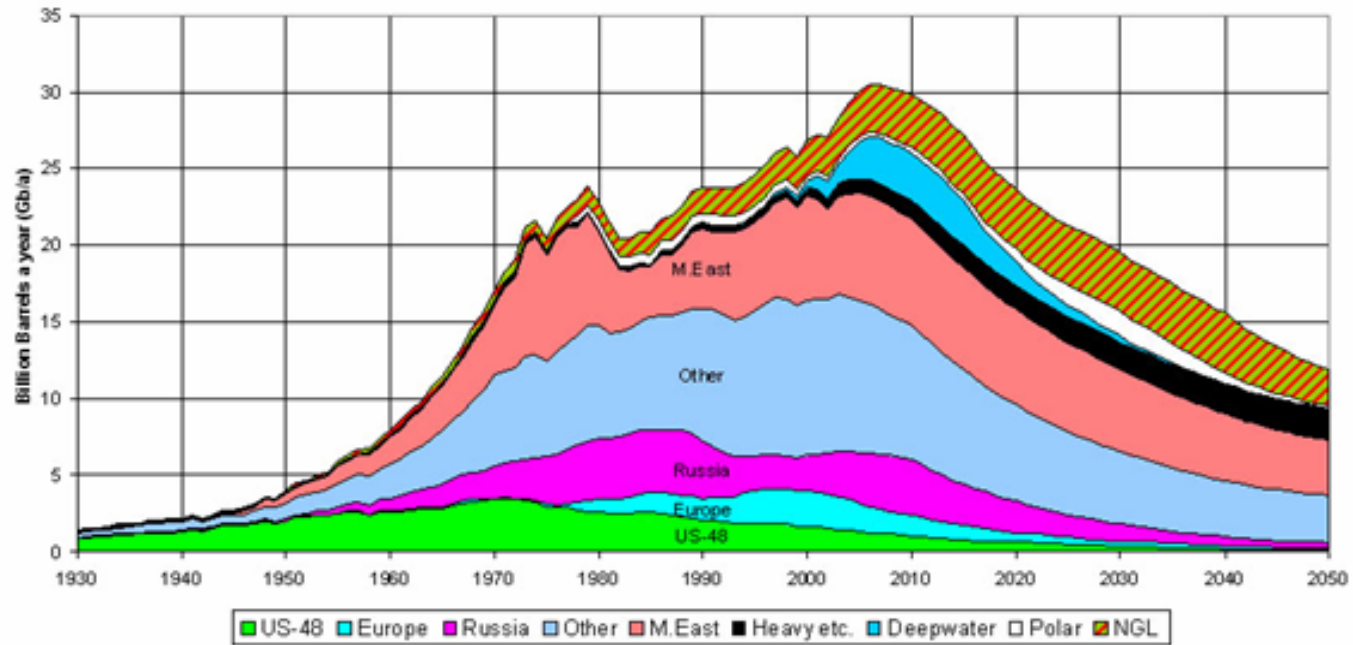
Today's Presentation



1. Why Build Green
2. Best Practices
3. Emerging Trends



OIL AND GAS LIQUIDS 2004 Scenario



Carbon dioxide levels in the atmosphere

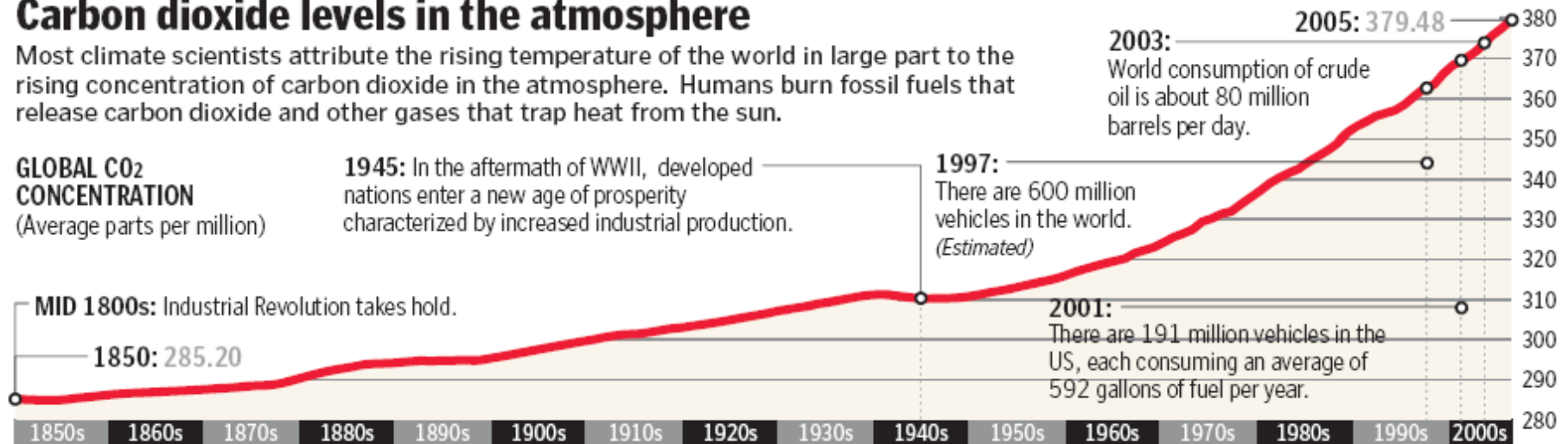
Most climate scientists attribute the rising temperature of the world in large part to the rising concentration of carbon dioxide in the atmosphere. Humans burn fossil fuels that release carbon dioxide and other gases that trap heat from the sun.

GLOBAL CO₂ CONCENTRATION
(Average parts per million)

1945: In the aftermath of WWII, developed nations enter a new age of prosperity characterized by increased industrial production.

1997:
There are 600 million vehicles in the world.
(Estimated)

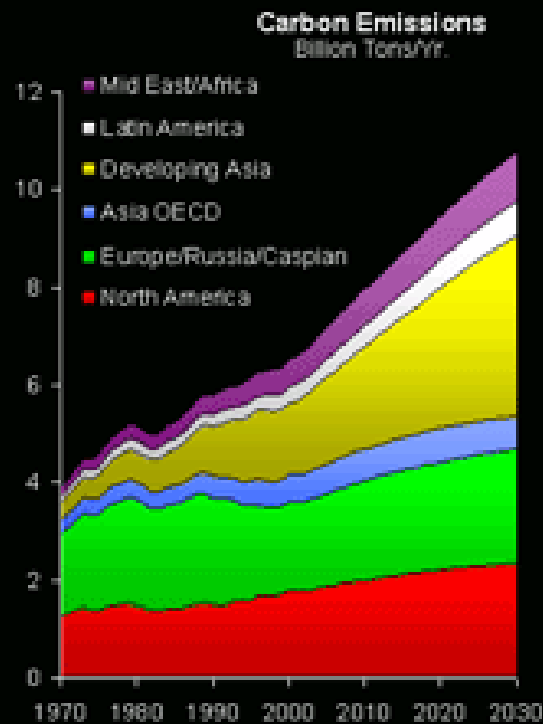
2003:
World consumption of crude oil is about 80 million barrels per day.



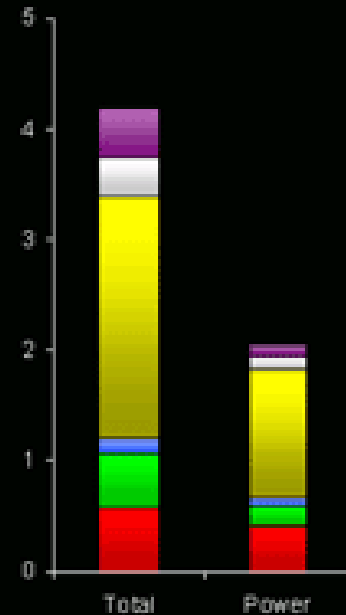
SOURCE: NASA Goodard Institute for Space Studies; Department of Energy; Ford Motor Company

JAMES ABUNDIS/GLOBE STAFF

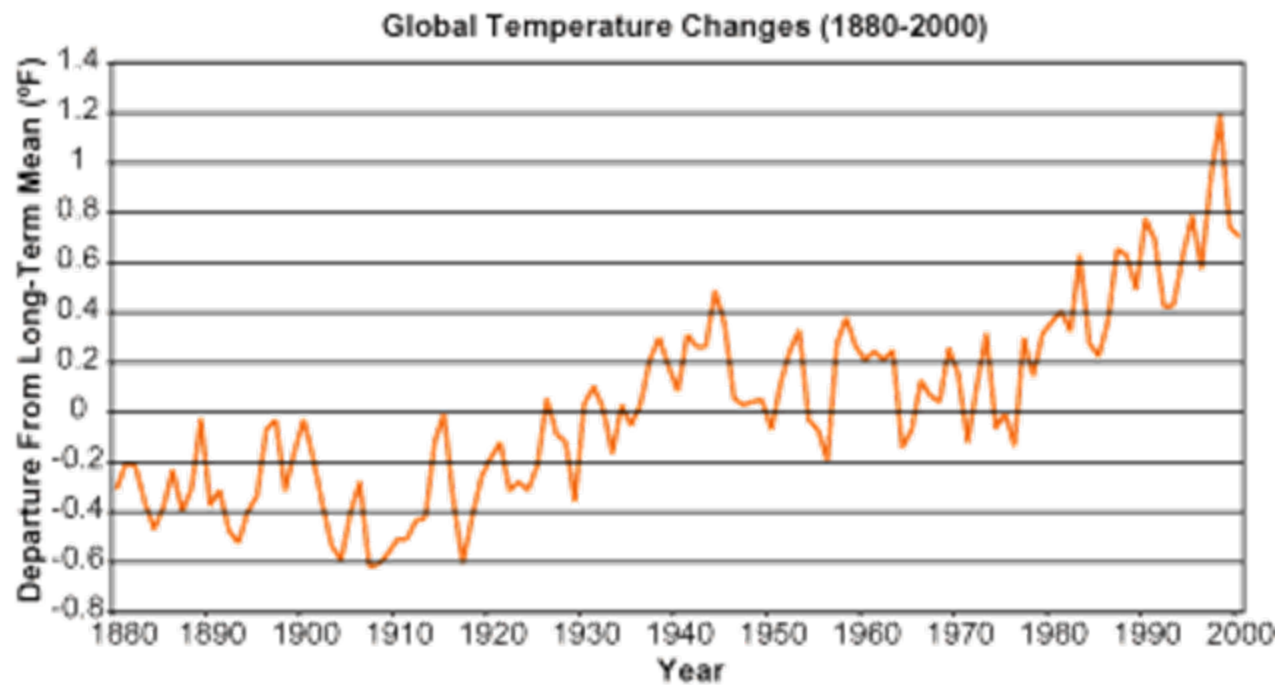
Carbon Growth led by Developing Asia Power



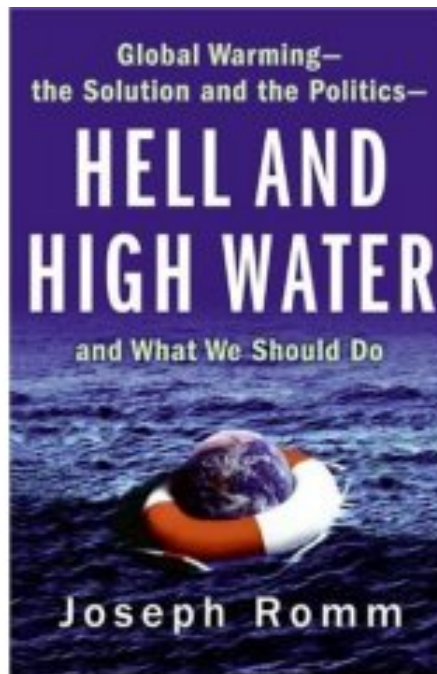
Carbon Emissions Growth
2001 to 2030
Billion Tons/Yr.



ExxonMobil



Source: U.S. National Climatic Data Center, 2001



Why We Should Demand Action Now

Global Warming

Deforestation

Rapid Economic Expansion

Fresh Water Shortages

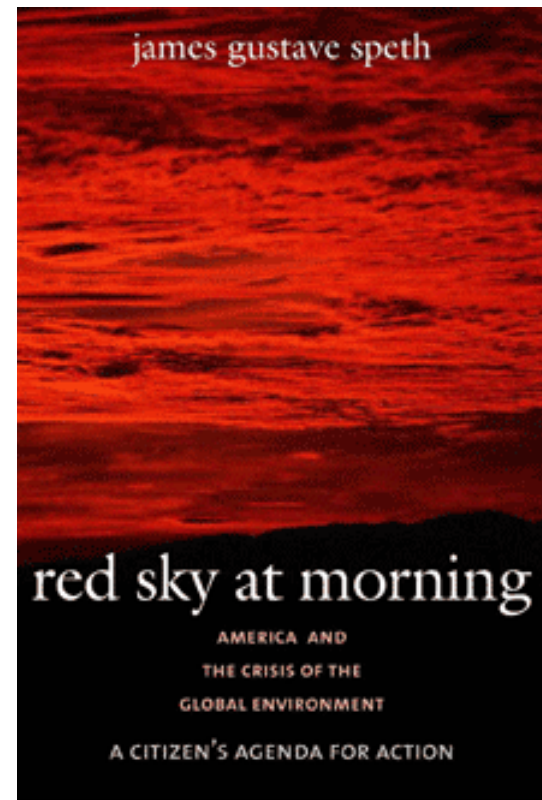
Land/Agricultural Productivity Degredadation

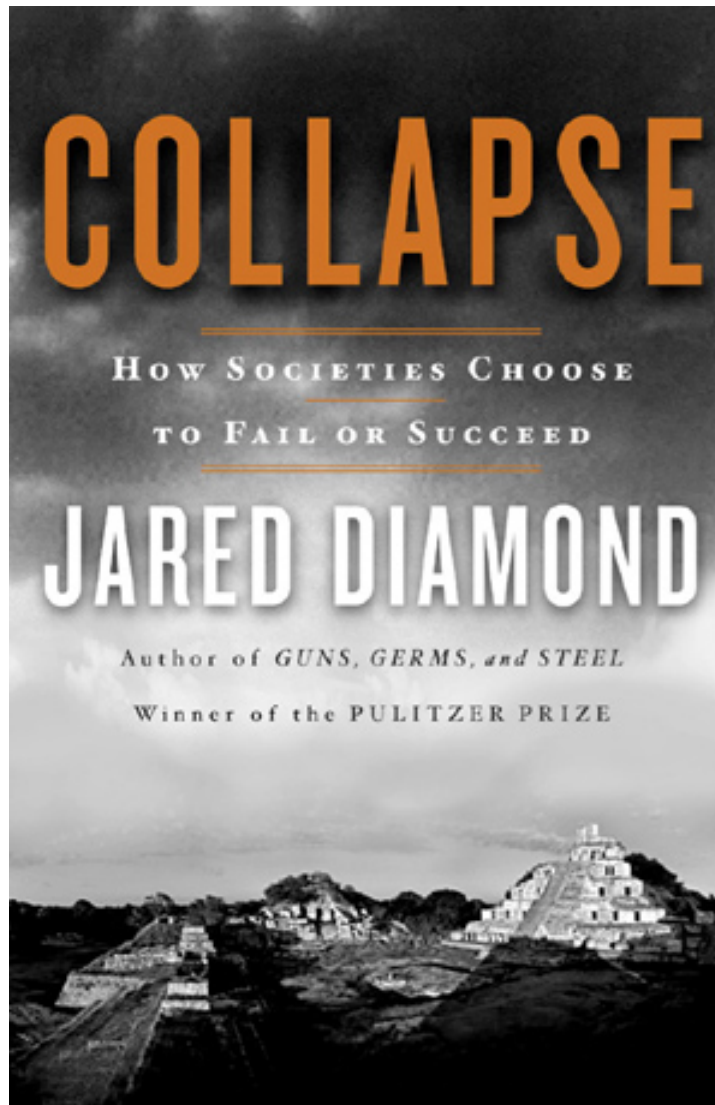
Energy Demand

Ocean/Fisheries depletion

Increasing Extinction

Toxic Chemicals/Residue Buildup



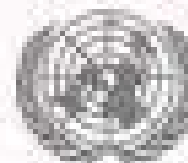








INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



Working Group III contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report

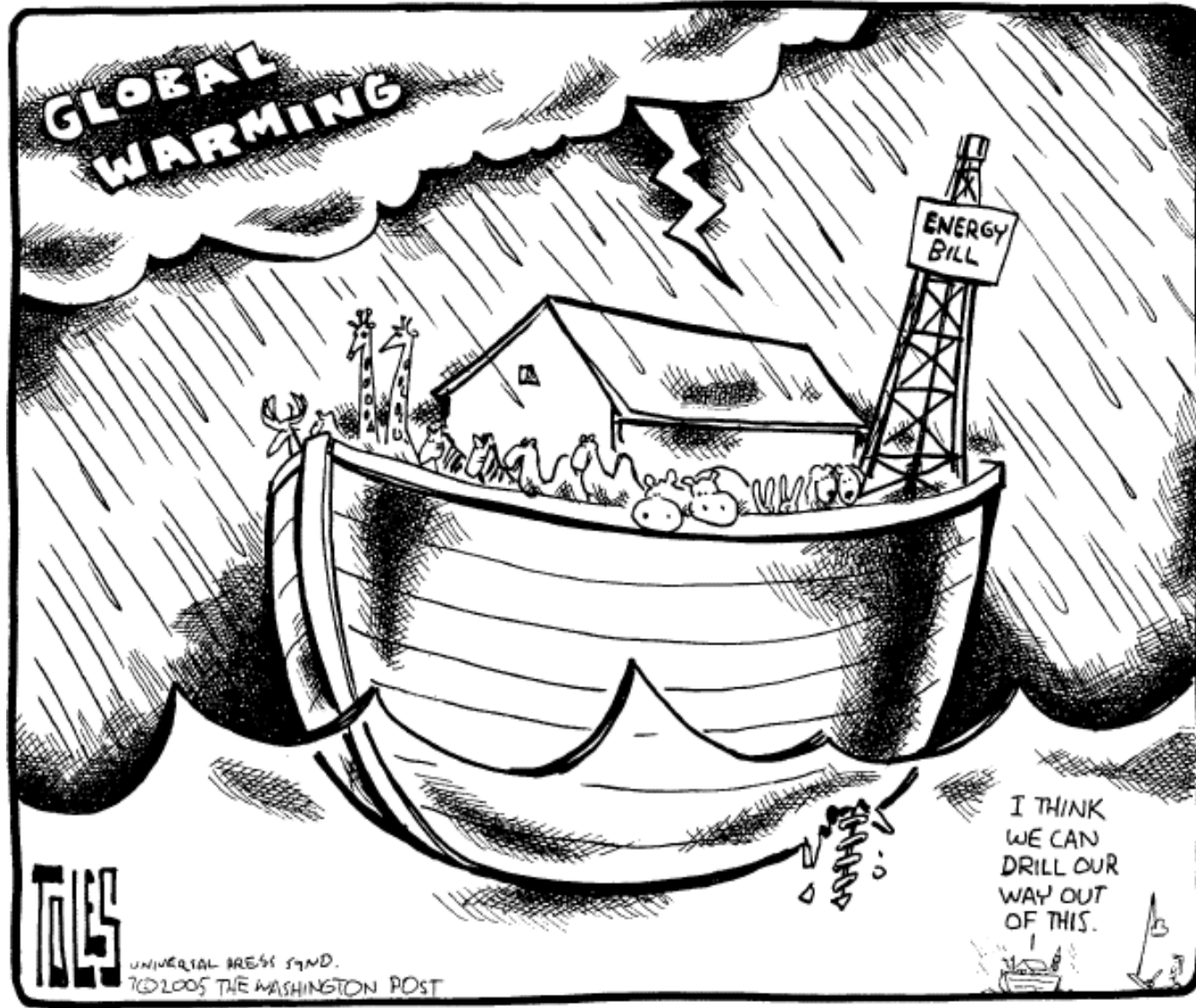
Climate Change 2007: Mitigation of Climate Change



Regional Greenhouse Gas Initiative

An Initiative of the Northeast & Mid-Atlantic States of the U.S.





TALS

UNIVERSAL PRESS SYND.
7/20/05 THE WASHINGTON POST

7-31-05

Options:

1. Business As Usual
2. Recognize The Trends and Turn the Ship



Environmental Impact of Buildings



- 65.2% of total U.S. electricity consumption
- > 36% of total U.S. primary energy use
- 30% of total U.S. greenhouse gas emissions
- 136 million tons of construction and demolition waste in the U.S. (approx. 2.8 lbs/person/day)
- 12% of potable water in the U.S.
- 40% (3 billion tons annually) of raw materials use globally

Source: U.S. Green Building Council

Economic Impact of Underperforming Affordable Housing

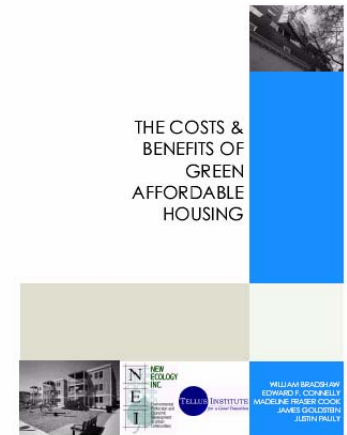


- Energy Budgets: 25% of operating budget and climbing
 - w/ annual 10% increases: >30% in 5 years
 - w/ annual 20% increases > 40% in 5 years
- Similar for water & sewer in high costs areas

Costs and Benefits of Greening Affordable Housing Report



- Grew out of demand for more information on how green applies to affordable housing
- Seeks to answer, “Is it worth it?”
- Originally identified 59 developments
- 16 cases completed
- Developed NPV analysis for measuring value



Overall Approach



- Compare life-cycle costs of actual green building developed versus hypothetical comparable conventional building
 - Total development costs
 - Operating costs (utilities, maintenance)
 - Replacement costs
- Consider first costs and life-cycle costs
- Discounts future costs and savings to account for time value of money

Life-Cycle Analysis



- Different perspectives in terms of who pays and who benefits (developers, residents, society)
- The benefits of greening accrue differently based on ownership structure



Conclusions and Results



- There is a small increase in up front project costs due to building green
 - A mean of 2.42% and median of 2.94% green premium of total development costs across the case studies (w/o PV 1.73% mean; 2.72% med.)
 - Range of –18.33% to 9.09%



Conclusions and Results



Cost of Greening (as % of *total construction costs w/o PV*)

Mean: 4.95%

Median: 3.83%

Range: -25% to 38.94%

(11 of 16 cases under 5%)

\$20.00 on line @
www.newecology.org

Conclusions and Results



What does the premium buy?

- Financial benefits—reduced costs and increased project value over 30 year life-cycle
- Non-quantifiable benefits

Residents Win!



- Utility costs are usually lowered
- Replacement costs reduced
- Total occupant (renter/owner) life-cycle benefits:

Median: \$ 7,370 per unit

Mean: \$12,637 per unit



Developer's Perspective



In and Out Developer usually does not benefit from any additional first costs.

Need:

- No increase in first cost
- Ability to pass on increases
- Creative Financing or Subsidy
- Long-term interest in the property



Is there value in a rating?



Developers With Long Term Interest



- Common area utility costs lower
- Replacement costs reduced
- Green subsidies available
- Project experience counts (many first timers in this study)

The Bottom Line



- Residents/Homeowners win or draw in 15 of 16 cases (1 draw)
- Owners/Developers win or draw in 7 of 16 cases before subsidy (2 draws)
- Owners/Developers win or draw in 10 of 16 cases after subsidy (3 draws) Cost: .5 to 3%
- Projects win in 14 of 16 cases

Lessons From The Cost/Benefit Report and Case Studies



It is cost effective to focus on:

- Energy Efficiency

Lessons From The Cost/Benefit Report and Case Studies



For 5% or less, we can make buildings that:

- *Use 30-50% less energy than code buildings to heat and cool*



Lessons From The Cost/Benefit Report and Case Studies



For 5% or less, we can make buildings that:

- *Use 20% less electricity*



Lessons From The Cost/Benefit Report and Case Studies



It is cost effective to focus on:

•Energy Efficiency

•Water Efficiency

Lessons From The Cost/Benefit Report and Case Studies



For 5% or less, we can make buildings that:

- *Use 10-20% less water--saving \$ on water bills, sewer bills and DHW costs*



Lessons From The Cost/Benefit Report and Case Studies



It is cost effective to focus on:

- Energy Efficiency
- Water Efficiency
- Landscaping/Drainage

Lessons From The Cost/Benefit Report and Case Studies



For 5% or less, we can make buildings that:

- *Have landscapes that are easier to maintain and provide more amenities to occupants*
- Infiltrate stormwater – often reducing costs



Lessons From The Cost/Benefit Report and Case Studies



It is cost effective to focus on:

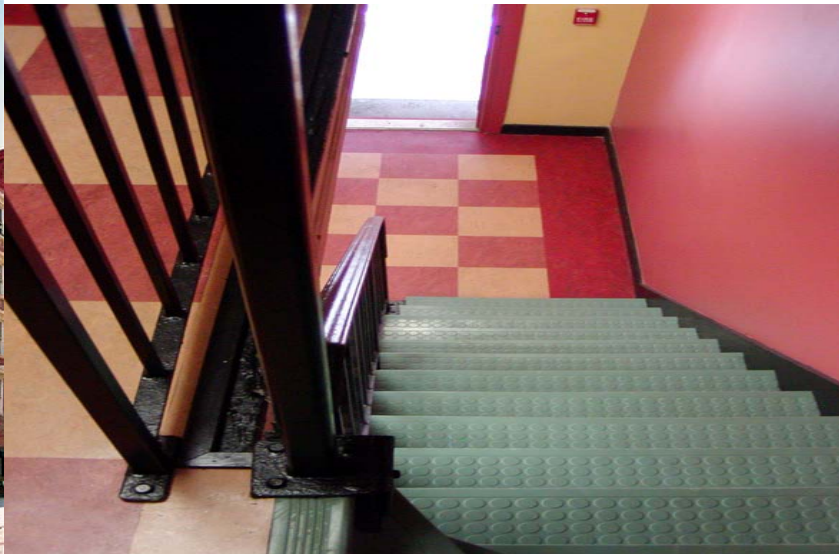
- Energy Efficiency
- Water Efficiency
- Landscaping/Drainage
- Durability

Lessons From The Cost/Benefit Report and Case Studies



For 5% or less, we can make buildings that:

- *Are more durable and cost less to maintain*



Lessons From The Cost/Benefit Report and Case Studies



It is cost effective to focus on:

- Energy Efficiency
- Water Efficiency
- Landscaping/Drainage
- Durability
- Health

Lessons From The Cost/Benefit Report and Case Studies



For 5% or less, we can make buildings that:

- *Are healthier to live in—better IAQ, less use of toxics/pesticides, more comfortable, quieter*



Lessons From The Cost/Benefit Report and Case Studies



For 5% or less, we can make buildings that:

- *Recycle demolition and construction waste*

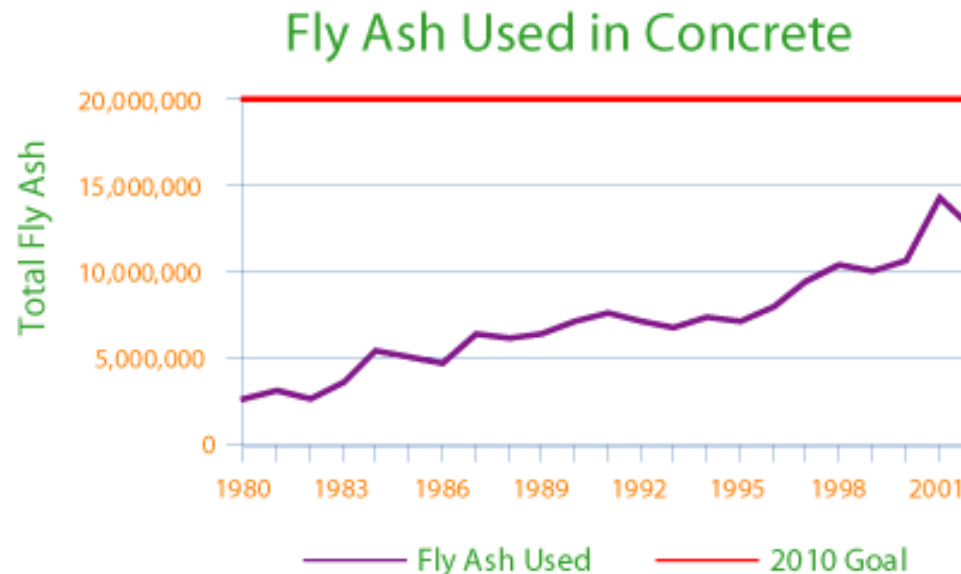


Lessons From The Cost/Benefit Report and Case Studies



For 5% or less, we can make buildings that:

- *Use recycled materials in construction*



Case Studies



Single Family:

Arroyo Chico, Santa Fe, NM

Rural Development Inc, Turners Falls, MA

Multi Family:

Third Street, New York, NY

Linden Street, Somerville, MA

Arroyo Chico

Santa Fe, NM

Project Information

Number of Units	17
Unit Type	Single-Family, Detached
Construction	New
Target Occupant	Low-Income, First-time Homebuyers
Developer	Santa Fe Community Housing Trust
Development Consultant	Guy Stanke
Contractor	Sage Builders
Architect	Suby Bowden
Total Square Footage	20,000
Total Development Cost	\$2,337,477
Average Cost per Unit	\$137,499
Average Cost per Foot	\$116.87
Incremental Cost to Build Green	0.90%
Green Building Focus	Material and Resource Efficiency
Average Price of House	\$152,647
Financing Sources	Charter Bank, New Mexico Mortgage Finance Authority, Federal Home Loan Bank of Dallas



Arroyo Chico, Cont.

Net cost of Greening: **\$17,288**
.74% TDC; .95% Const.
\$1017/unit

Green Features:

- Passive solar gain
- Xeriscaping
- Low-e windows
- Ceramic tile flooring
- Water harvesting system
- Cellulose blown insulation
- Radiant floor heating
- Metal roof

Measurable Benefits:

- energy efficiency, replacement costs

NPV:

Residents: +\$132,936, 5.08%; \$7820/unit;

Developers: \$0 (passed on to buyers)

Rural Development, Inc.

Turners Falls, MA



Five 3-4 BR Homes in
five rural Ma towns:

TDC: \$842,956

Construction Cost: \$532,060

Green Premium: \$42,833

Total Sq Ft: 6363

Cost/Sq Ft: \$132

Affordability: 46-58% AMI

Rural Development Inc, Cont.

Net cost of Greening: **\$42,833**

-5.08% TDC; 8.1% Cons

-2.02% TDC; 3.2% Cons

Green Features:

-Energy Star

-Water Efficient

-Low-e windows

-Some PV



- Plywood Cabinets

- High Efficiency boilers

Measurable Benefits:

-energy efficiency-20-25% fuel cost reduction

-1000 Kwh energy plus RECs for 2 units with 1 KW solar

228 and 299 Third Street

New York, NY



Two Apartment Buildings:
22 and 38 Units

Cost: \$121 per square ft.

Green Premium: \$0



228 and 299 Third Street, cont

Net Cost of Greening: \$0

Green Features:

- Energy efficient
- Innovative building envelope and wall structures, individual apt air sealing and ventilation, thermal mass inside insulation
- Structural durability, hardwood
- Standard efficiency windows and boiler

Measurable Benefits: 15% of NYC avg energy use
3.5 btu/hdd/sqft

Linden Street Apartments

Somerville, MA

Project Information

Name	Linden Street Apartments
Location	Somerville, MA
Number of Units	42
Unit Type	Multi-Family, attached
Construction	New
Target Occupant	Low-Income, including Section 8
Developer	Somerville Community Corporation
Development Consultant	Paula Herrington
Contractor	Landmark Structures Corporation
Architect	Mostue & Associates
Total Square Footage	50,970
Total Cost	\$10,013,785
Average Cost per Unit	\$238,423
Average Cost per Foot	\$196
Incremental Cost to Build Green	\$20,150
Green Building Focus	Material and Resource Efficiency
Financing Sources	Citizen's Bank - Boston Community Capital, Massachusetts Department of Housing and Community Development, City of Somerville, Local Initiatives Support Corporation - National Equity Fund, Federal Home Loan Bank, Boston Community Loan Fund



Linden Street, Cont.

Net cost of Greening: **\$20,150**
.18% TDC; .30% Const.
\$479/unit

Green Features:

- Site Remediation
- Xeriscaping
- Rainwater recharge
- Low-e windows
- No VOC adhesives
- Bike racks
- Open space creation
- Community integration and access
- Low flow toilets
- Icynene and cellulose insulation
- Bathroom fans for increased air quality
- Tall windows for daylighting and safety

Measurable Benefits: energy + water efficiency, painting cost

NPV: Residents: +\$2,514,162; \$59,861/unit; developer \$286,920/337,320

Linwood Court

Cambridge, MA

Energy Assessment of Underperforming Asset



Linden Street Apartments and Linwood Court Building Energy Use (heating) Comparison



Linwood Court – Conventional building

- 6 units, 5,988 sq. ft.
- 13.17 BTU/SF/HDD (Total of 439,863,000 BTU/YR)

Linden Street – Green Buildings

- 6 units, 6,570 sq. ft.
- 4.30 BTU/SF/HDD (Total of 158,070,000 BTU/YR)

The Green Building is using 33% of Energy for Heating!

Linden Street Apartments and Linwood Court Building Energy Use (heating) Comparison



Linwood Court – Conventional building

- 4 units, 4,394 sq. ft.
- 11.63 BTU/SF/HDD (Total of 285,150,000 BTU/YR)

Linden Street – Green Buildings

- 3 units, 4,530 sq. ft.
- 5.10 BTU/SF/HDD (Total of 129,470,000 BTU/YR)

The Green Building is using 44% of Energy for Heating!



Why Are The Case Studies Successful?



- That was Their Goal
- (Not seeking certification)
- Integrated Design
- Talent and Dedication

Why Are The Case Studies Successful?



- Developed a vision of the project that combines programmatic purpose, building design and building performance.
- Expect and demand green and other project goals

Desire



All human actions have one or more of these seven causes: chance, nature, compulsions, habit, reason, passion, desire.

Aristotle

Why Should We Desire Green Affordable Housing?



Mitigate Risk of Rising Operating Costs

- Energy & Water
- Maintenance
- Turnover Expenses
- Owner Costs

Trade uncertain operating costs for fixed costs

Why Should We Desire Green Affordable Housing?



Mitigate Risk of Liability

What is the Next Lead Paint-type issue?

- Asthma: increasing evidence that IAQ has a significant effect on attacks: Potential liability for not reducing triggers?
- Mold
- Pesticide exposure



The “Resilience” of Housing

Why Should We Desire Green Affordable Housing?



Mitigate Risk of Cost Overruns

Greening Helps Control Costs:

- **Green = Quality Construction/Quality Project**
- **Strategy for field verification, commissioning, tenant/management education**
- **Projects tend to be better planned and speced**

Why Should We Desire Green Affordable Housing?



Community

- Better sense of community
- Pride of owning/living in a superior asset
- Compare commercial -- cannot quantify productivity, employee retention, sick days usage



Why Should We Desire Green Affordable Housing?



- Market demand
- Profitability
- Pending regulation
- Cache
- Fundraising

Why Should We Desire Green Affordable Housing?



- The people we serve deserve this type of quality
- Leaving the less well off behind



If Greening is So Great, Why Isn't it Ubiquitous?



- Failure to “Think Green” Early
- Poor Team Selection
- Key Decisions Made Before Goals Set
- Lack of Integrated Design Approach

How To Make Every Project Greener



Problem: Failure to “Think Green” Early

Solutions: Develop a vision of the project that combines ***programmatic*** purpose, building ***design*** and building ***performance***.

Expect and demand a green project that meets other goals

How To Make Every Project Greener



What to Demand:

- Density/TOD
- High levels of Energy and Water efficiency
- Stormwater control
- Low maintenance/high value landscaping
- Improved IAQ/Health
- Durability
- Materials
- Recycling



WWW.GREENCOMMUNITIESONLINE.ORG

How To Make Every Project Greener



Problem:

Poor Team Selection

Solutions:

1. Assemble a team that can form programmatic, design and performance visions into reality.
2. Hire architect that is experienced in Integrated Design & eager to explore alternatives to the conventional
3. Address payment issues early
4. Participate in selection of architect's subs
5. Get help-green consultant

How To Make Every Project Greener



At this stage, do not need to understand subtleties of green building—just ask how those you hire will achieve improved performance, along with quality design and satisfying program needs

How To Make Every Project Greener



Who else can influence owner's early stage decisions?

- Financiers
- Local Governments-LEED, other requirements
- Architects-as a way to distinguish themselves
- Green Consultant

How To Make Every Project Greener



Problem: Key Decisions Made *Before* Goals Set

- Financing Applications; Permitting; Community Process
- Decisions Made:* Density, orientation, height/size, construction techniques, parking, footprint

Solutions:

- Hold a design charrette before even a schematic sketch is produced
- Set Design/Program/Performance goals early

How To Make Every Project Greener



Recognize and compensate for typical owner's first concerns:

- How will I pay for the project?
- Will it sell? Will I make a profit?
- Can I get it permitted? How fast?
- Fear of additional cost
- Burning cash, let's get started

How To Make Every Project Greener



Problem: Lack of Integrated Design

Solutions: You're on your way!

Integrated Design-A Primer



- “Whole-building” systems-oriented approach to design
- Integrates the architecture with the mechanical, electrical, and plumbing systems to create synergies
- Brings together architects, engineers, others across disciplines and technologies from project initiation

Why Integrated Design is Better



- Works to meet project goals from the beginning
- Takes into consideration multiple solutions to design problems
- Reduces chances of costly change orders
- Can smooth permitting process



Success!



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